CLAIMS:

1. An electromagnetic radiation sensor assembly, comprising:

a heat bath;

an antenna element for receiving radiant electromagnetic energy;

a thermally responsive absorber element coupled to the antenna element and including means for absorbing and detecting radiant electromagnetic energy received by said antenna element;

an intermediate stage for thermally isolating the absorber element from the heat bath, said intermediate stage including a first and a second thermal isolation member each having a predetermined thermal conductance interconnecting the absorber element to the intermediate stage and the intermediate stage to the heat bath, the first thermal isolation member being located between the absorber element and the intermediate stage and the second thermal isolation member being located between the intermediate stage and the heat bath;

an electro-thermal feedback circuit incorporated into the intermediate stage for reducing the thermal conductivity between the absorber element and the heat bath by causing the temperature of the intermediate stage to converge to the temperature of the absorber element when detecting electromagnetic radiation, thus effectively causing the thermal conductance of the first thermal isolation member to attain a minimum conductance value and thereby improve the sensitivity of the radiation sensor towards the radiation limit; and

wherein the electro-thermal feedback circuit includes a heat generating amplifier including a bipolar transistor integrated with the intermediate stage and means for detecting the temperature difference between the absorber element and the intermediate stage and generating an output voltage signal dependent on the received

electromagnetic radiation to control the power generated by the amplifier, wherein the heat generated by the transistor included in the amplifier itself directly heats the intermediate stage in response to said temperature difference signal so as to equality the temperature between the absorber element and the intermediate stage.

2. A sensor assembly according to claim 1 wherein said sensor assembly comprises a two-tier device and wherein said antenna element, said absorber element and said intermediate stage comprises substantially co-planar elements located above the heat bath.

3. A sensor assembly according to claim 1 wherein said antenna element is located on an upper outer surface of said heat bath.

4. A sensor assembly according to claim 1 wherein the assembly comprises an x-y sensor assembly including x-y address readout circuits, and wherein said heat bath, said antenna element, said absorber element and said intermediate stage form a single pixel addressed by the x-y address readout circuits.

5. A sensor assembly according to claim 1 wherein the spectral response of at least one of the elements including said absorber element and said antenna element is adjusted to operate in a predetermined region of the electromagnetic spectrum, including at least the Infrared region of the electromagnetic spectrum.

6. A sensor assembly according to claim 4 wherein said predetermined region also includes millimeter wave region of the electromagnetic spectrum.

7. A sensor assembly according to claim 4 wherein said absorber element comprises a bolometer.

8. A sensor assembly according to claim 4 wherein said absorber element includes resistor means and temperature sensor means, wherein said resistor means is ac coupled to the antenna to receive and absorb the electromagnetic energy, and said temperature sensor means is thermally coupled to the resistor means to monitor its temperature.

9. A sensor assembly according to claim 4 wherein said pixel is fabricated in silicon.

10. A sensor assembly according to claim 4 wherein a plurality of said pixels are included in an array of pixels.

11. A sensor assembly according to claim 2 wherein said intermediate stage includes a support member and, wherein said support member and said isolation members form a bridge for positioning the absorber element above the means providing a heat bath.

12. A sensor assembly according to claim 11 wherein said heat bath includes a substrate and an upper body portion on which the antenna element is mounted, said upper body portion including a cavity over which the intermediate stage and the absorber element are located.

13. A sensor assembly according to claim 2 wherein said amplifier including a bipolar transistor comprises a differential amplifier and wherein said means for detecting the temperature

difference includes first and second diodes for respectively sensing the temperature difference between said absorber element and said intermediate stage.

14. A sensor assembly according to claim 12 wherein the first and second diodes are connected in back-to-back circuit relationship and to the amplifier inputs.

15. A sensor assembly according to claim 3 wherein said intermediate stage includes a centralized opening therein and wherein said absorber element is located in said opening,

16. An electromagnetic radiation sensor assembly, comprising:

an array of sensor pixels, each of said pixels including,

a heat sink in the form of a heat bath member,

an antenna element for receiving radiant electromagnetic energy mounted on the heat bath member,

a thermally sensitive detector element coupled to the antenna element for detecting the radiant electromagnetic energy,

an intermediate stage located between the detector element and the heat bath member, and

a support structure for the intermediate stage comprising a first thermal isolation member having a predetermined thermal and electrical conductance connecting the detector element to the intermediate stage and a second thermal isolation member having a predetermined thermal and electrical conductance connecting the intermediate stage to the common heat bath member;

an electro-thermal feedback circuit in the intermediate stage for reducing the thermal conductivity between the detector element and the heat bath member by causing the temperature of the intermediate stage to converge to the temperature of the detector

element in response to absorbed electromagnetic radiation, effectively causing the thermal conductance of the first thermal isolation member to attain a minimum conductance value and thereby improve thermal isolation and thus the sensitivity of the sensor element toward the radiation limit; and,

wherein the electro-thermal feedback circuit includes a heat generating amplifier, including a bipolar transistor, integrated with the intermediate stage as well as means for detecting the temperature difference between the detector element and the intermediate stage and generating a temperature difference signal for controlling the solid bipolar transistor and the heat generated thereby; and, wherein the heat generated by the bipolar transistor itself directly heats the intermediate stage in response to said temperature difference signal so as to converge the temperature of the intermediate stage to the temperature of the detector element.

17. An electromagnetic assembly according to claim 16 wherein the antenna element, the detector element, the intermediate stage are substantially coplanar in a two tier assembly with the heat bath.

18. A sensor assembly according to claim 16 wherein said detector element comprises a bolometer.

19. A sensor assembly according to claim 16 wherein the spectral response of at least one of the elements including the detector element and the antenna element is adjusted to operate in a predetermined region of the electromagnetic spectrum.

20. A sensor assembly according to claim 18 wherein the predetermined region includes the infrared and/or millimeter wave region of the electromagnetic spectrum.

21. An electromagnetic radiation sensor assembly, comprising:

heat bath means;

antenna means located on an outer surface of the heat bath means for receiving electromagnetic radiation;

heat absorber means for detecting electromagnetic radiation received by the antenna means;

thermal isolation means located between the intermediate stage and the heat bath means and the heat absorber means for thermally isolating the heat absorber means from the heat bath means;

first means having a predetermined thermal and electrical conductance for connecting the heat absorber means to the thermal isolation means, and

second means having a predetermined thermal and electrical conductance for connecting the thermal isolation means to the heat bath means; and,

electro-thermal feedback circuit means incorporated into the thermal isolation means for reducing the thermal conductivity between the heat absorber means and the heat bath means by causing the temperature of the thermal isolation means to converge to the temperature of the heat absorber means when detecting electromagnetic radiation, effectively causing the thermal conductance of the first means for connecting to attain a minimum conductance value and thereby improve the sensitivity of the sensor assembly toward the radiation limit;

wherein the electro-thermal feedback circuit means includes heat generating bipolar transistor amplifier means integrated with the thermal isolation means, and means for detecting the temperature difference between the heat absorber means and the thermal isolation means and generating a temperature difference signal for controlling

the power delivered by the bipolar transistor amplifier to the intermediate stage;; and,

wherein the heat generated by the bipolar transistor amplifier means directly heats the thermal isolation means in response to said temperature difference signal so as to equalize the temperature between the heat absorber means and the intermediate stage.

22. A sensor assembly according to claim 21 wherein said antenna means, said heat absorber means, and said thermal isolation means form a two-tier sensor assembly.